Determining the influence of high flows of the spawning behavior of chum salmon at Ives Island

Project 1999003

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This document is a plan for proposed experimental flows from Bonneville Dam to examine the effects of elevated flows on chum salmon spawning behavior at Ives Island. This study is being funded by BPA under project 1999003 and will take place during from November 1 through mid December, 2005. This plan is preliminary and I welcome input from the FPAC, TMT, COE, and BPA to keep this study relevant to the needs of the fishery managers.

Background and rationale

In 2004, we conducted experimental flow tests by increasing tailwater elevations from 11.5 ft to 15.1 ft and back down to 11.5 ft. Acoustically tagged fish that had a redd generally remained at the redd during a flow test. Although fish were not displaced by the flows we evaluated, we began to see increases in swimming activity by fish to maintain their position in the current and decreases in nest digging activity as tailwaters and velocities increased. However, our tailwater elevation steps were only 2 h in duration. It is possible that if these tailwaters were maintained for longer periods of time, chum salmon spawning behavior may be further altered. In 2005, I would like to examine fish responses to tailwaters that are elevated for longer periods (8 h). This will provide insight as to how long flows could be elevated if water needed to be moved into the daytime to reduce nighttime peaks. In addition, I would like to evaluate a higher tailwater elevation more typical of those that have occurred at night in recent years. I am proposing to focus the majority of our testing and effort on evaluating tailwater elevations of 13.5 ft and 15.5 ft. The elevation of 13.5 ft was selected because this is the tailwater elevation that will be requested in a SOR should the need arise to provide additional spawning habitat when fish densities are high. In addition, this is also the tailwater elevation that provides flow to the channel on the north side of Ives Island where fish were observed spawning in 1998 and 1999 under higher flows. The elevation of 15.5 ft was selected because this is near the point where fish behavior was being impacted in 2004. At this elevation, water velocities were up to 1.5 m/s in the main spawning area, which is outside the range of suitability for chum salmon. Conducting longer-duration tests at this elevation will help us determine if fish can maintain spawning behavior for an extended time at this level. Finally, it represents a conservative upper limit of a tailwater elevation not to exceed based on 2004 results. The upper limit of 17.5 ft was selected by first examining the hourly flows at Bonneville Dam for November and December for the last 10 years. Ninety percent of the hourly flows were less than 215 kcfs, which I selected as the upper flow bound. I then calculated the mean Bonneville tailwater elevation for this flow to arrive at 17.5 ft. I propose to conduct only

a few tests at this elevation toward the end of the spawning season when more water would hopefully be available.

Approach

At a minimum, I propose to conduct 5 tests at 13.5 ft, 5 tests at 15.5 ft, and 2 tests at 17.5 ft. More tests would be better, but this depends on BPA's flexibility in providing flows for tests on weekends, for example. Because by early December (last year) it was difficult to obtain sufficient numbers of fish for tagging, I would like to conduct more tests during November when we are more likely to collect fish. This would entail conducting tests on Saturday and/or Sunday if possible. In 2005, I will assume no diel effect during testing and request day and night tests in order to complete the requisite number of tests. Each test would be 8 h in duration. The ramp rates and times for tests are shown in Table 1. During each test, we will monitor the locations of acoustically tagged fish in our telemetry array, monitor changes in spawning behavior with acoustic and underwater video cameras, measure changes in water velocities, and search newly inundated areas for spawning activity and redds. We will also be monitoring changes in riverbed temperatures in cooperation with PNNL.

Table 1. Proposed ramp rates and times for 2005 flow tests.

Target tailwater	Time	Tailwater elevation
Daytime		
13.5 ft	07:00	11.5 ft
	08:00	13.5 ft
	16:00	11.5 ft
Nighttime		
13.5 ft	16:00	11.5 ft
	17:00	13.5 ft
	01:00	11.5 ft
Daytime		
15.5 ft	06:00	11.5 ft
	07:00	13.5 ft
	08:00	15.5 ft
	16:00	13.5 ft
	17:00	11.5 ft
Nighttime		
15.5 ft	15:00	11.5 ft
	16:00	13.5 ft
	17:00	15.5 ft
	01:00	13.5 ft
	02:00	11.5 ft
Daytime		
17.5 ft	06:00	11.5 ft
	07:00	14.5 ft
	08:00	17.5 ft
	16:00	14.5 ft

	17:00	11.5 ft
Nighttime		
17.5 ft	15:00	11.5 ft
	16:00	14.5 ft
	17:00	17.5 ft
	01:00	14.5 ft
	02:00	11.5 ft

In 2004, we scheduled daytime tests on Wednesdays and nighttime tests on Thursdays so as not to conflict with the work of other cooperators in the area. We request these same days for testing in 2005, which would require 5 weeks for testing. However, I would like to compress this schedule by working with BPA to schedule additional tests in November when fish are more abundant. Testing will begin when there are sufficient numbers of chum at Ives, hopefully by the second week in November.

Requested Actions

I would like input from FPAC, TMT, COE, and BPA concerning 1) the proposed ramp rates and maximum tailwater elevation for testing, and 2) the scheduling of 5 weeks of testing (Wednesday [day], Thursday [night]) versus a compressed schedule for testing (Wednesday [day], Thursday [night], and Saturday and/or Sunday tests [depending on COE, BPA flexibility])